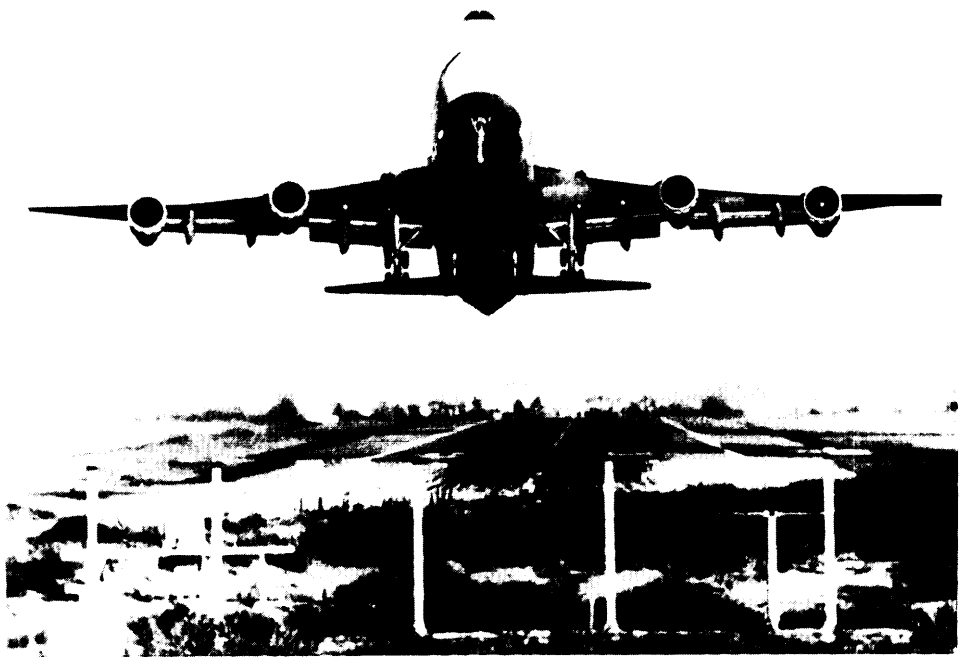
Chapter 3

Regulatory and Institutional Framework



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Regulatory and Institutional Framework

The Federal Aviation Administration (FAA) has a dual mandate: ". . . to promote safety of flight . . . in air commerce through standard setting . . ." and to encourage and foster the development of air commerce.[1] The Airline Deregulation Act, passed in 1978 to encourage industry competition, removed Federal controls over routes, fares, and new entries, but left unaltered the FAA's responsibility for commercial aviation safety. Events of the past decade have shown that neither Congress nor the executive branch fully comprehended the complexity of regulating a newly competitive industry. Although commercial aviation maintains an enviable safety record, dramatic growth in air travel, major changes in technology and industry operations and structure, the firing of the air traffic controllers, and Federal budget constraints have left FAA scrambling to catch up. Consequently, public attention has again focused sharply on whether FAA has the institutional capability and resources to carry out its operating, standard setting, rulemaking, and technology development functions effectively and to guarantee compliance through its inspection programs.

Before 1978, the relative stability of the commercial airline industry made carrying out FAA's regulatory activities less contentious. Industry changes occurred slowly, fewer carriers were competing for the travel dollar, and the costs of required safety improvements could be passed quickly to the consumer. Today's environment is dramatically different, forcing FAA to oversee an industry in which major players come and go, and airlines must expand markets and control labor and other operating costs carefully or go bankrupt. One consequence is that aircraft manufacturers and airlines scrutinize critically any changes of safety regulations, especially those requiring expensive new technology or additional personnel training. Moreover, Federal policies have explicitly discouraged new regulation, unless judged cost-effective, while local government policies have restrained new airport development. This chapter provides an overview of the evolution of Federal aviation safety laws and regulations, describes the current institutional framework, provides analyses of the FAA safety programs, and the impact of local regulations on airport use and development.

[1]Public Law 85-726.

HOW IT ALL BEGAN

The roots of today's aviation safety programs, including their rough edges, extend back to the early days of aviation in the mid-1920s. Early commercial uses of aircraft included advertising, aerial photography, crop dusting, and carrying illegal shipments of liquor during Prohibition. Initial efforts to establish scheduled passenger service were short-lived, as service catered primarily to wealthy east coast tourists and was expensive relative to the country's well developed rail and water travel networks.

Air Mail Service

Growth of commercial aviation was greatly stimulated by the establishment of the U.S. Air Mail Service in the early 1920s, Regulations established by the Post Office Department required its pilots to be tested and to have at least 500 hours of flying experience and set up aircraft inspection and preventive maintenance programs. These early regulatory requirements improved air mail carrier safety—in 1924, commercial flyers experienced one fatality per 13,500 miles, while the Air Mail Service had one fatality per 463,000 miles.[2]

In 1925, Congress enacted the Air Mail Act, authorizing the Post Office Department to transfer air mail service to private operators. Twelve carriers, some of which evolved into today's major airlines,

[2]Nick A. Komons, *Bonfires to Beacons* (Washington, DC: U.S. Department of Transportation, Federal Aviation Administration, 1978), p. 25.

Photo credit: Smithsonian Institution

An air traffic controller is on duty at the first radio-equipped air traffic control tower at the Cleveland, Ohio airport in 1930.

began air mail operations in 1926 and 1927. These carriers offered limited passenger service, which was much less profitable than carrying mail.[3] Small independent operators, using Ford and Fokker trimotor airplanes, handled most of the passenger service in the late 1920's, the forerunners of today's commuter airlines and air taxis.

Early Safety Initiatives

No Federal safety program existed, prompting a number of States to pass legislation requiring aircraft licensing and registration. In addition, local governments of all sizes enacted ordinances regulating flight operations and pilots, creating a patchwork of safety-related requirements and layers of authority. Modern versions of these difficulties are discussed later in this chapter. Despite strong industry support for Federal legislation, Congress was unable to reach agreement on the scope and substance of a statute until 1926.[4] when the Air Commerce Act was passed.[5] The new law charged the Department of Commerce with both regulatory authority over commercial aviation and responsibilities aimed at promoting the fledgling industry. The major provisions of the act authorized the regulation of aircraft and airmen in interstate and foreign commerce; provided Federal support for charting and lighting airways, maintaining emergency fields, and making weather information available to pilots; authorized aeronautical research and development programs; and provided for the investigation of aviation accidents. Local governments were left with jurisdiction over airport control.

Within the Department of Commerce, a new Aeronautics Branch, comprised of existing offices already engaged in aviation activities, was formed to oversee the implementation of the new law. Nine district offices of the Regulatory Division of the Aeronautics Branch were established to conduct inspections and checks of aircraft, pilots, mechanics, and facilities, and share licensing and certification responsibilities with the Washington, DC office. The basic allocation of responsibilities survives to this day, although the Department of Commerce responsibilities now rest with the Department of Transportation (DOT) and its arm, FAA.

The first set of regulations was drafted with substantial input from aircraft manufacturers, air transport operators, and the insurance industry. Compared with current standards, pilot requirements were minimal; in addition to written and flight tests, transport pilots were required to have 100 hours of solo flight experience, while industrial pilots needed only 50 hours.

Current procedures for certifying aircraft and engines also originated under these early regulatory programs. Aircraft manufacturers were required to comply with minimum engineering standards issued by the Department of Commerce in 1927, and one aircraft of each type was subject to flight testing to obtain an airworthiness certificate for the type.

The Aeronautics Branch also collected and analyzed data from aircraft inspection reports, pilot records, and accident investigations. These data were made accessible to the insurance industry, allowing the development of actuarial statistics. A direct consequence of this step was a significant reduction in insurance rates for many carriers. However, the Department of Commerce, cognizant of its role to promote the aviation industry, was reluctant to make public disclosures about the results of individual accident investigations, despite

[3] Initially, air mail contractors were paid a percentage of postage revenues. In 1926, however, an amendment to the Air Mail Act of 1925 required payment by weight carried.

[4] Key issues debated by Congress included whether to separate military and civil aviation activities, what responsibilities should be left to State and local governments, and how to provide Federal support for airports. Komons, op. cit., footnote 2, pp.35-65.

[5] *Congressional Record,* 69th Cong., 1st sess., May 20, 1926, 9811.

a provision in the 1926 act directing it to do so. Eventually, in 1934, the Air Commerce Act was amended, giving the Secretary of Commerce extensive powers to investigate accidents, including a mandate to issue public reports of its findings.[6] This congressional policy decision put safety considerations ahead of protecting the industry's image.

As additional regulations to improve safety were implemented, accidents involving passenger carriers and private aircraft decreased significantly; between 1930 and 1932, the fatality rate per 100 million passenger-miles declined by 50 percent.[7] Updated regulations established more stringent requirements for pilots flying aircraft in scheduled interstate passenger service, including flight time limitations.[8] Other requirements specified the composition of flight crews, established standards for flight schools, improved takeoff and landing procedures, set minimum flight altitudes and weather restrictions, and required multi-engine aircraft to be capable of flying with one inoperative engine. In addition, certification of carriers providing scheduled passenger service in interstate commerce commenced in 1930. Although financial data were not examined by the Department of Commerce, standards for key personnel, the ground organization of a carrier, maintenance procedures, and aircraft equipment and instruments had to be met.[9]

The Beginning of Economic Regulation

During the 1930s, industry expansion and the development of aircraft and communication technologies required continuous improvements of regulations, airways, and airports. However, budget constraints prevented the Department of Commerce from conducting sufficient inspections and keeping up with airway development needs. Moreover, a series of fatal accidents in late 1935, 1936, and 1937, including one in New Mexico that killed a New Mexico Senator, called into question the adequacy of existing regulations.[10]

The Civil Aeronautics Act of 1938 marked the beginning of economic regulation. It required airlines, with or without mail contracts, to obtain certificates authorizing service on specified routes, if the routes passed a test of public convenience and necessity.[11]

The Act created the Civil Aeronautics Authority (CAA), which was responsible for safety programs and economic regulations, including route certificates, airline tariffs, and air mail rates. Within CAA, a separate Administrator's Office, answering directly to the President, was responsible for civil airways, navigation facilities, and controlling air traffic.[12] However, in June 1940, under the Reorganization Act of 1939, CAA was transferred back to the Department of Commerce and the Civil Aeronautics Board (CAB) was created and made responsible for regulatory and investigatory matters.

An Expanding Federal Role

Federal responsibilities for airway and airport development grew tremendously during World War II, leading to passage of the Federal Airport Act of 1946, and initiating Federal financial assistance to States and municipalities. The Federal Government assumed responsibility for air traffic control (ATC) at this time. However, the inspector force could not keep pace with the rapidly increasing numbers of new airplanes, pilots, and aviation-related facilities. As early as 1940, CAA had designated certain parts of the certification process to industry. For example, flight instructors were permitted to certificate pilots, and a certificated airplane repaired by an approved mechanic could fly for 30 days until it was

[6] R.E.G. Davies, *Airlines of the United States Since 1914* (Washington, DC: Smithsonian Institution Press, 1972), p. 201.

[7] Komons, op. cit., footnote 2, p. 124.

[8] Pilots were restricted to flying 100 hours per month, 1,000 hours during any 12-month period, 30 hours for any 7day period, and 8 hours for any 24-hour period; a 24-hour rest period was also required for every 7-day period. These requirements, established in 1934, and virtually the same today, upgraded earlier restrictions which limited pilots to 110 hours of flight time per month. In addition, a waiver of the 8-hour limitation for a 24-hour period could also be granted by the Department of Commerce. The 8-hour waiver rule was ultimately eliminated following a fatal accident involving a pilot who had exceeded 8 hours of flight, and pressure from the Air Line Pilots Association. Ibid, pp. 290-292.

[9] Ibid, pp. 116-118, and Davies, op. cit., footnote 6, p. 201.

[10] The fatality rate rose from 4.78 per 100 million passenger-miles in 1935 to 10.1 per 100 million passenger-miles in 1936. Komons, op. cit., footnote 2, p. 295.

[11] Civil Aeronautics Act of 1938, Public Law 75-706.

[12] Increasing air traffic between Newark, Cleveland, and Chicago prompted a group of airlines to establish an air traffic control system in 1934. By 1936, however, the Department of Commerce assumed control of the system and issued new regulations for instrument flight. Komons, op. cit., footnote 2, p. 312.

checked by an available CAA inspector. After the war, CAA limited its aircraft certification and inspection role to planes, engines, and propellers; manufacturers became responsible for ensuring that other aircraft parts met CAA standards.[13]

Decentralized Management.–Regulatory and organizational changes also took place during and after the war. Regional offices of CAA, reduced in number to seven in 1938, became more autonomous in 1945. Regional officials became directly responsible for operations in their regions, although technical standards and policies were still developed in Washington, DC. Except for a brief return to more centralized management in the late 1950s, regional autonomy within FAA has persisted to this day, slowing communications between and among headquarters and the regions and intensifying inequities in regulatory applications.

Updating Regulations.–Fatal crashes in the late 1940s and early 1950s prompted revised standards setting minimum acceptable performance requirements, designed to ensure continued safe flight and landing in the event of failure of key aircraft components. These standards also distinguished small and large airplanes based on existing airplane and powerplant design considerations; small airplanes were those with a maximum certificated takeoff weight of 12,500 pounds or less, while airplanes above 12,500 pounds were defined as large.[14] This distinction is still applied by FAA today, despite significant changes in aircraft design.

Industry Expansion

Beginning of Air Taxi Service.–Surplus war transport airplanes and a new supply of pilots led to the development of the nonscheduled operator or air taxi. Exempt from economic regulation by the Civil Aeronautics Act of 1938, these operators transported persons or property over short distances in small airplanes, often to locations not serviced by the certificated airlines. CAA, at the time sympathetic to private and small operators, applied less stringent safety regulations to air taxis. ’s In 1952, exemption from economic regulation became permanent, even for carriers using small aircraft to provide scheduled service.’s

Certificated Airlines.–The decade following World War II witnessed enormous industry growth. Pressurized aircraft traveling at greater speeds and carrying more passengers were introduced.[17] In addition to scheduled passenger service, air freight operations expanded when CAB granted temporary certificates of public convenience and necessity to four all-cargo airlines in 1949.[18] Certification and operating rules for commercial operators—those offering contract air service for compensation or hire–were also adopted in 1949.[19]

Responding to Industry Growth

However, despite continuing increases in air traffic and the need for better airports to accommodate larger and faster aircraft, Federal support for ATC facilities, airport development, and airway modernization was insufficient. CAA, faced with budget reductions in the early 1950s, was forced to abandon control towers in 18 small cities and numerous communications facilities, postpone jet development and navigation improvements, and curtail research efforts. The Federal airport development program, championed by cities and smaller municipalities, was embroiled in controversy. In addition, the number of CAA regional offices was reduced from 7 to 4, 13 safety inspection field offices were eliminated, and the industry designee program was expanded.

The impending introduction of jet aircraft and a 1956 midair collision over the Grand Canyon involving a DC-7 and a Super Constellation helped promote congressional authorization of increased levels of safety-related research and more Federal inspectors. In 1958, Congress passed the Federal Aviation Act establishing a new aviation organization, the Federal Aviation Agency .20 Assuming

[13] John R M Wilson, *Turbulence Aloft: The Civil Aeronautics Administration Amid Wars and Rumors of Wars, 1938-1953* (Washington, DC: U.S. Department of Transportation, Federal Aviation Administration, 1979), p. 152.

[14] Ibid, p. 261; and 43 *Federal Register* 46734 (Oct. 10, 1978).

[15] Wilson, op. cit., footnote 13, p. 161”

[16] The Civil Aeronautics Board adopted 14 CFR 298, designating an exempt class of small air carriers known as “air taxis.”

[17] Initially, Lockheed produced the Constellation which carried 60 passengers and was 70 mph faster than the DC-4. To compete with Lockheed, Douglas developed the DC-6. Subsequently, upgraded versions of each aircraft-the DC-7 and the Super Constellation—were introduced. Davies, op. cit., footnote 6, p. 289.

[18] The four carriers were Air News, Flying Tigers, Slick, and U.S. Airlines. See Nawal K. Taneja, The *Commercial Airline Industry* (Lexington, MA: Lexington Books, D.C. Heath and Co., 1976), p. 6.

[19] 44 *Federal* Register 66324 (Nov. 19, 1979).

[20] Public Law 85-726, Aug. 23, 1958, 72 Stat. 731.

many of the duties and functions of CAA and CAB, the Agency was made responsible for fostering air commerce, regulating safety, all future ATC and navigation systems, and airspace allocation and policy. CAB was continued as a separate agency responsible for economic regulation and accident investigations.[21]

The safety provisions of the 1958 act, restating earlier aviation statutes, empowers the Agency to promote flight safety of civil aircraft in air commerce by prescribing:[22]

- minimum standards for the design, materials, workmanship, construction, and performance of aircraft, aircraft engines, propellers, and appliances;
- reasonable rules and regulations and minimum standards for inspections, servicing, and overhauls of aircraft, aircraft engines, propellers, and appliances, including equipment and facilities used for such activities. The Agency was also authorized to specify the timing and manner of inspections, servicing, and overhauls and to allow qualified private persons to conduct examinations and make reports in lieu of Agency officers and employees;
- reasonable rules and regulations governing the reserve supply of aircraft, aircraft engines, propellers, appliances, and aircraft fuel and oil, including fuel and oil supplies carried in flight;
- reasonable rules and regulations for maximum hours or periods of service of airmen and other employees of air carriers; and
- other reasonable rules, regulations, or minimum standards governing other practices, methods, and procedures necessary to provide adequately for national security and safety of air commerce.

In addition, the act explicitly provides for certification of airmen, aircraft, air carriers, air navigation facilities, flying schools, maintenance and repair facilities, and airports.[23]

In the years following creation of the Agency, Federal safety regulations governing training and equipment were strengthened despite intense opposition from industry organizations. The number of staff members also grew in the early 1960s, and inspection activities were stepped up, including en route pilot checks and reviews of carrier maintenance operations and organizations.[24]

In 1966, the Federal Aviation Agency became the Federal Aviation Administration, when it was transferred to the newly formed Department of Transportation (DOT) .25 The National Transportation Safety Board (NTSB) was also established to determine and report the cause of transportation accidents and conduct special studies related to safety and accident prevention; accident investigation responsibilities of CAB were moved to NTSB.

Renewed support for improvements to airports, ATC, and navigation systems was also provided by the Airport and Airway Development Act of 1970. The act established the Airport and Airway Trust Fund, financed in part by taxes imposed on airline tickets and aviation fuel, and was reauthorized in 1987.[26]

Recognizing that existing industry descriptors, such as trunks, locals, and commuters (see box 3-A), were no longer appropriate, CAB redesignated scheduled passenger airlines into the following groups based on annual revenues:

- major airlines (above $1 billion);
- national airlines ($75 million to $1 billion);
- large regional airlines ($10 million to $75 million); and
- medium regional airlines (up to $10 million).[27]

[21]However, the Federal Aviation Administration Administrator was authorized to play an appropriate role in accident investigations. In practice, the Federal Aviation Administration routinely checked into accidents for rule violations, equipment failures, and pilot errors. Moreover, the Civil Aeronautics Board delegated the responsibility to investigate nonfatal accidents involving fixed-wing aircraft weighing less than 12,500 pounds to the Federal Aviation Administration. Stuart I. Rochester, *Takeoff at Mid-Century: Federal Aviation Policy in the Eisenhower Years, 1953-1961* (Washington, DC: U.S. Department of Transportation, Federal Aviation Administration, 1976), p. 234.

[22]49 U.S.C. 1421(a).

[23]See 49 U.S.C. 1430, 1422-1424, 1426, 1427, and 1432. Procedures for amending, suspending, or revoking certifications are contained in 49 U.S.C. 1429.

[24]Federal Aviation Administration staff grew from 30,000 in 1959 to 40,000 in 1961. Rochester, op. cit., footnote 21, p. 295.

[25]U.S. Department of Transportation Act, Public Law 89-670, 49 U.S.C. 1651.

[26]For additional information on implementation problems associated with the Trust Fund, see J. Glen Moore and Patricia Humphlett, Congressional Research Service, "Aviation Safety: Policy and Oversight," Report #86-69SPR, May 1986.

[27]U. S. Department of Transportation, Federal Aviation Administration, *FAA Handbook of Statistical Information, Calendar Year 1986 (Washington,* DC: 1987), P. 118.

Airline Deregulation

Prompted by widespread dissatisfaction with CAB policies and the belief that increased competition would enhance passenger service and reduce commercial airline fares, Congress enacted the Airline Deregulation Act of 1978.[28] Specifically, the act phased out over a 6-year period CAB control over carrier entry and exit, routes, and fares. In 1984, the remaining functions of CAB were transferred to DOT. These functions include performing carrier fitness evaluations and issuing operating certificates, collecting and disseminating financial data on carriers, and providing consumer protection against unfair and deceptive practices.[29]

During the 60-year history of Federal oversight, Federal regulatory and safety surveillance functions have been frequently reorganized and redefined. Moreover, public concerns about how FAA carries out its basic functions have remained remarkably

[28]Public Law 95.504, 92 Stat. 1703. It was thought that fares would drop based on the record of intrastate airlines where fares were 50-70 percent of the Civil Aeronautics Board-regulated fares over the same distance. In addition, the Civil Aeronautics Board had already reduced restrictions on fare competition in 1976 and 1977 and allowed more airlines to operate in many city-pair markets. Robert M. Hardaway, "Transportation Deregulation (1976- 1984): Turning the Tide," *Transportation Law Journal*, vol. 14, No. 1, 1985, p. 136.

[29]Civil Aeronautics Board Sunset Act of 1984, Public Law 98-443, Oct. 4, 1984, 98 Stat. 1703.

Box 3-A.—A Regulatory Enigma: When is a Commuter an Air Carrier and When is it an Air Taxi?

Federal regulations define and set requirements for commuters using a confusing variety of different and overlapping definitions. The Airline Deregulation Act of 1978 made the term "commuter" virtually meaningless in commercial aviation—in fact, the former Commuter Airline Association of America changed its name to the Regional Airline Association. Currently, the two broad categories of commercial aviation transportation are: 1) certificated air carriers, and 2) air taxi operators. Commuters are categorized as air taxi operators that provide passenger service for at least five round trips per week between two or more points.[1] Previously, the Civil Aeronautics Board (CAB) designated as commuters those scheduled operators of aircraft with 30 or fewer seats who were not certificated under Section 401 (public convenience and necessity) of the Federal Aviation Act. Since deregulation, however, the economic definition of commuter was limited to operators of aircraft with 60 seats or fewer. Consequently, many airlines identified now as commuters operate under the same safety regulations as major jet carriers, following their training and experience rules for pilots, and maintenance and airworthiness requirements for aircraft.

Operations

The primary safety regulations governing airline operations are 14 CFR 121 (air carrier) and 135 (air taxi operator). Airlines providing service with aircraft designed to carry more than 30 passengers or over 7,500 pounds of cargo must adhere to the more stringent Part 121 rules. Differences between Parts 121 and 135 include training, experience, and work hours for pilots, and maintenance and safety equipment for aircraft. As operating rules are the key determinant in aviation safety, the National Transportation Safety Board and the Federal Aviation Administration's (FAA) Associate Administrator for Aviation Standards use Parts 121 and 135 as broad categories for classifying accidents and other safety statistics, and OTA followed suit in this study.

Airworthiness

Airworthiness standards for aircraft used in Part 121 and Part 135 operations are divided into two main sections—Part 23 for small airplanes and Part 25 for large transport category airplanes. In 1953, the dividing line between small and large airplanes was set at 12,500 pounds, regardless of type of operation. However, over time, commercial aircraft weighing just under 12,500 pounds proliferated. In 1987, FAA established a commuter category of aircraft with 19 or fewer passenger seats and takeoff weight of 19,000 pounds or less, and amended airworthiness requirements in Part 23 to cover this category. Appendix A of Part 135 includes additional airworthiness requirements for commuter aircraft with 10 to 19 seats. Aircraft with at least 20 seats are certificated under Part 25 (but aircraft that operate under Part 121 with fewer than 20 seats must be certificated under Part 25). Before 1987, commercial aircraft with up to 30 passenger seats were certificated under special conditions or Special Federal Aviation Regulation numbers 23 and 41. These were intended to provide relief to the industry and

[1]14 CFR 298.2.

constant despite a steadily improving aviation safety record. OTA's brief historical summary demonstrates that:

- Specifically authorized by legislation after lengthy debate in the 1950s, industry participation in regulatory activities has a long history, Responsible Federal aviation agencies consistently have designated part of the certification and inspection processes to the private sector, specifically certification of pilots, aircraft parts, and aircraft repair. This reliance on private industry is heaviest when national budget constraints lead to shortages of Federal inspectors and technical expertise.
- From the initial 1926 legislation to the 1978 Deregulation Act, Congress has charged Federal agencies with the dual responsibilities of maintaining aviation safety and promoting the industry which history shows are not always compatible. Furthermore, except for a 2-year period from 1938 to 1940, Federal regulatory and enforcement functions have been combined in one agency.
- Federal aviation regulatory enforcement activities have always been decentralized with regional and district offices having considerable autonomy and independence from Washington headquarters.
- More stringent safety standards usually follow a widely publicized airline accident and vocal public and congressional concern, rather than public from lack of suitable certification procedures and standards while FAA developed permanent rules.

Economic Fitness and Reporting

Federal economic regulatory provisions and traffic and financial reporting requirements for air carriers also depend on aircraft size: 14 CFR 217 and 241 govern operations of aircraft with maximum capacity greater than 60 passengers, and 14 CFR 298 covers smaller aircraft. While all airlines certificated under Section 401 must meet certain economic fitness requirements, those that operate small aircraft (60 seats or fewer) have greatly reduced data reporting requirements. In 1952, Part 298 established a class of small air carriers exempt from economic regulation called '(air taxi operators." CAB designated as "commuters" those air taxi operators that offered scheduled passenger service. While commuters must meet the same safety standards as small certificated air carriers, they have fewer traffic and financial data reporting requirements than the certificated airlines. Other air taxi operators report no data under Part 298.

nonregulatory Differences

Air traffic controllers use yet another set of terms for classifying airlines. In compiling statistics on the users of air traffic control (ATC) services, controllers categorize aircraft as air carriers (commercial aircraft larger than 60 seats), air taxis (all other commercial users), military, or general aviation (all other aircraft). Commuters are not differentiated in ATC traffic statistics. Since many air taxis operate small single engine aircraft, controllers often count them as general aviation aircraft unless otherwise identified by a flight plan or aircraft livery.

Until 1986, FAA **statistics on near** midair collisions grouped aircraft in three categories only: air carrier, general aviation, and military. Under this grouping, all commercial aircraft are air carriers, although FAA now subcategories air carriers as large air carriers, commuters, and air taxis.

Federal Standards for Commuter Airlines[a]

	Large airline	Small airline
operations	**Part** 121	**Part** 135
Airworthiness	Part 25	Part 23
Economic fitness and reporting	Parts 241 and 217	Part *298*

Commuter airlines must comply with large airline regulations for:[c]	Aircraft size (in passenger seats)[b] 1-9	10-19	20-30	31-60	61+
Operations	X	–	X	X	T - T
Airworthiness[d]	–	X	X	X	
Economic fitness and reporting[e]	–	–	–	–	**X**

[a]Airlines that provide scheduled short haul passenger service in propellor-driven aircraft with fewer than 61 seats are considered generally to be commuters.
[b]Aircraft size can be classified also by payload weight, but is not shown here.
[c]Regulations for large airlines are the most stringent in each category; a commuter or other small airplane operator can choose to follow them when they are not mandatory.
[d]If an airline follows large airline operating rules, then the aircraft, regardless of size, flown under those rules must meet the airworthiness standards for large transport category aircraft.
[e]If an airline has one or more aircraft in service with more than 60 passenger seats, then the airline must adhere to large airline data reporting requirements for every aircraft in its fleet.

SOURCE: Office of Technology Assessment, 1988.

from FAA initiatives. Recent examples include legislation enacted in late 1987 of collision avoidance equipment requirements for commercial aircraft and broadened altitude encoding transponder requirements for general aviation aircraft.

FEDERAL AVIATION SAFETY STRUCTURE

FAA Responsibility

Since Congress dismantled CAB, FAA has been the chief regulator of the U.S. airline industry, with some political and analytic support from other parts of DOT. The task is formidable. On the one hand, the agency must stand up to intense pressure from DOT and industry on proposed regulatory changes, and, on the other, address constant public and congressional anxieties about safety and convenience. FAA's effectiveness has been undercut by budget constraints affecting personnel and procurement, equipment obsolescence, inadequate, long-range, comprehensive planning, and problems with its inspection and rulemaking programs. (Table 3-1 shows the impacts of budget constraints on personal levels in critical areas.) Furthermore, local governments play major roles in determining airport operations and development, often conflicting with FAA goals. Only an agency with strong leadership and singleness of purpose and responsibility could maintain a steady course under such conflicting pressures.

Although all FAA sections have safety related activities, responsibility for the largest safety programs is under the purviews of the Associate Administrators for Air Traffic, Aviation Standards, and Development and Logistics. Also, all nine regional offices have broad and separate authority, as does the Mike Monroney Aeronautical Center in Oklahoma City. This splintering of authority has long been recognized as creating fundamental organizational problems within FAA and in its relationship to Congress, DOT, and industry.

- *Aviation Standards.* Headquartered in Washington, Aviation Standards manages field offices in charge of both airworthiness standards for aircraft and regulations for all air carrier operations. The Aviation Standards National Field Office, located in Oklahoma City, has responsibility for a variety of support activities, including management of national safety databases and conduct of standardization training for designated examiners. Aviation Standards also receives technical support from the FAA Technical Center in Atlantic City, New Jersey, for regulatory development and for research and testing related to crashworthiness and fire safety.
- *Air Traffic.* Through the regions, Air Traffic is responsible for operation of the 20 Air Route Traffic Control Centers, 176 Terminal Radar Approach Control facilities, hundreds of airport towers, the Central Flow Control Facility, plus Flight Service Stations located throughout the United States and Puerto Rico. In addition, Air Traffic formulates plans and requirements for future ATC operations, and evaluates and analyzes current ATC operations.
- *Development and Logistics.* Development and Logistics is in charge of technology development, implementation, and maintenance, and

Table 3-1.–Selected FAA Employee Totals, 1978-87

Occupation	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987
Air traffic controller[a]	16,750	16,853	16,584	6,658	11,416	11,946	11,944	12,245	12,429	12,847
Aviation safety inspector[b]	1,466	N/A	1,499	1,615	1,423	1,331	1,394	1,475	1,813	1,939
Electronics technician	9,423	9,209	8,871	8,432	8,031	7,633	7,229	6,856	6,600	6,740

[a]Full performance level and developmental controllers at towers and centers.
[b]Air carrier inspectors (approximately 40 percent of the total) were responsible for 145 air carriers, while general aviation inspectors were responsible for 173 Part 135 commuter airlines, 7,S04 other commercial aircraft operators, and 5,210 aviation schools and repair stations as of Mar. 10, 1988.
communications, navigational aid, radar, and automation technicians.

SOURCE: Office of Technology Assessment baaed on Federal Aviation Administration data as follows: controller data as of September 19S7; inspector data as of March 1988; and technician data as of March 1986.

Photo credit' Federal Aviation Administration

FAA air traffic controllers in the control tower during the annual International Experimental Aircraft Association Convention and Aviation Exhibition handle 400 takeoff and landing operations per hour.

has overall responsibility for the National Airspace System (NAS) Plan. Offices within Development and Logistics include Automation Service, which is in charge of upgrading the ATC system and implementing the Advanced Automation System. Program Engineering Service directs other NAS Plan programs, and Systems Engineering Service handles system engineering for the NAS Plan, advanced systems and concepts, and development of the NAS Performance Analysis Capability for system-wide airspace management. Systems Maintenance Service directs maintenance of the NAS. The FAA Technical Center performs engineering and testing for NAS Plan developments, in support of Development and Logistics.

Within FAA, two additional groups have explicit safety responsibilities.

- *Aviation* Safety. Reporting directly to the FAA Administrator, Aviation Safety coordinates accident investigations, safety analyses, and special studies. Aviation Safety monitors safety activities of FAA programs, but does not function effectively as support to the operations of these programs.
- Mike Monroney *Aeronautical Center.* Located in Oklahoma City, the Center houses the FAA Academy, the Civil Aeromedical Institute (CAMI), the Aviation Standards National Field Office, and the Airway Facilities National Field Support Center. The Academy is the principal training facility for air traffic controllers. The Aviation Standards Training Branch at the Academy trains flight standards and airworthiness inspectors, flight inspectors, and other personnel who work in Aviation Safety. CAMI researchers focus on improving selection and

training for air traffic controllers, medically related aspects of aviation, including controllers' performance in the field, and physiological studies of pilot performance.

Other Federal Safety Roles

Other DOT offices oversee economic regulatory activities previously performed by CAB.

- The Office of the Secretary of Transportation (OST) issues certificates of public convenience and necessity required for all new carriers. OST also convenes government/industry meetings when necessary to handle scheduling peaks and delays.
- The Office of Aviation Operations and Aviation Enforcement and Proceedings in the General Counsel's Office performs fitness tests that examine a new carrier's management capability, financial posture, and regulatory compliance record.
- The Office of Aviation Information Management in the Research and Special Programs Administration collects economic information from major, national, regional, and commuter airlines as required especially under 14 CFR 241 and 14 CFR 298.

The National Transportation Safety Board.– Although not a regulatory agency, NTSB is an important institutional part of the safety structure. Created in 1966 as an arm of DOT, it became an independent executive branch agency in 1975. In addition to investigating commercial transport accidents, NTSB conducts special safety studies and issues recommendations that often call for rule revisions or for new Federal regulations and procedures to correct safety problems. FAA conducts its own review of accidents and is not bound to accept NTSB suggestions for regulatory changes.

FAA Funding

Federal Government funding for aviation-related programs comes from two sources: the Airport and Airway Trust Fund and from general tax revenues. The trust fund is financed by excise taxes on the aviation industry and its users, including an 8 percent ticket tax on commercial air passenger transportation within the United States. In addition, the unused portion of the trust fund accumulates interest credit payments from the Treasury. Currently, the largest contributor to the trust fund is the ticket tax, which accounted for 69 percent of the trust fund in 1985, followed by interest payments. Aviation excise taxes are deposited in the general find of the Treasury. Although trust funds accounted for about 70 percent of FAA's total budget in fiscal year 1985, FAA consistently spends less out of the trust fund than is taken in from excise taxes and interest payments on the balance in the trust fund. Consequently money accumulates in the Treasury, where, according to current Federal accounting standards, it can be counted against the Federal deficit. [30] Critics of this policy believe the full resources of the fund should be available to FAA for operation and research and development rather than used as a tool to reduce the Federal deficit figures.

Organizational Issues—System Safety Management

Notable in this brief description of FAA safety offices is the absence of a strong, internal system safety management advocate. A comprehensive approach to system safety could be described as:

> The application of engineering and management principles, criteria, and techniques to optimize safety within the constraints of operational effectiveness, time and cost throughout all phases of the system life cycle.[31]

Basic system safety management principles are applicable to commercial aviation and to the National Airspace System. A comprehensive system safety management program for FAA would apply to all aspects of planning, data collection and analysis, engineering, and operations. For example, the economic health and management stability of an airline strongly influence its ability and willingness to bear the cost of such safety activities as recurrent cockpit resource management and weather training for pilots, internal safety audits, and stand-

[30] U. S. Congress, General Accounting Office, *Aviation Funding: Options Available for Reducing the Aviation Trust Fund Balance,* GAO/RCED-86-124BR (Washington, DC: U.S. Government Printing Office, May 1986).

[31] U.S. Department of Defense, *Military Standard: System Safety Program Requirements,* MIL-STD-882B (Washington, DC: Mar. 30, 1987).

ardizing equipment and procedures. Yet while different offices within FAA have recognized the importance of all these factors, the agency has not systematized procedures to incorporate them in all areas of its oversight activities. Human error, the leading cause of commercial aviation accidents, also receives little FAA attention (see chapter 6). These shortcomings speak to a need for coherent integrated safety management at FAA, beyond the development and enforcement of individual regulations and specific programs targeted at isolated problems.

In the absence of FAA system safety capability, this function is partially performed by groups such as Congress and airline labor unions, especially on issues where powerful interest groups differ vehemently (such as altitude encoding transponders). However, effective safety management is highly technical and requires continual close, objective attention to system-wide needs. These are beyond the capability of such groups.

System safety principles are also applicable to the NAS Plan, throughout all phases of its evolution and development of its elements, such as ATC technologies. NAS Plan programs often encompass some elements of system safety analysis. For example, the Traffic Alert/Collision Avoidance System (TCAS) program includes modeling and analysis of the effects of TCAS-induced maneuvers on air traffic, and other efforts to try to identify hazards in the use of TCAS before it is fully implemented. Procedural changes in the terminal area are evaluated through "worst case" scenarios, operational judgment of experienced controllers, and other means, in an attempt to prevent accidents. These efforts are commendable, but maintaining or improving air safety as traffic levels increase will require a more systematic and broader approach to safety management. FAA's Office of Aviation Safety is developing system safety standards for FAA procurements based on military system safety standards. This is a good first step, but commitment will be needed to incorporate the principles fully into FAA's rigid technology development process, and, beyond that, into the entire life cycles of NAS.

The ATC system and supporting technologies warrant immediate special attention from a system safety perspective. The ATC system is currently under severe pressure to extend its operations to the limits of safe practice to meet the demand for service at busy hub airports. Furthermore, while the need to modernize ATC facilities is widely recognized, FAA's current plans include advanced automation features that are difficult to justify on the basis of efficiency and raise important human-factor questions (see chapter 7). Rigorous system safety management, both for the near term and the longer term, would help maintain the excellent accident record of the ATC system, as FAA rises to the challenge of managing higher traffic levels. Resources are required for near-term ATC needs, such as increasing personnel levels and upgrading the computers in Terminal Radar Approach Control facilities. These are needed to accommodate increases in traffic and transponder users. Attention to formulating a better system safety groundwork for the more advanced parts of the system is also important.

Internal Communications

An additional and related problem is internal FAA communication paths. As shown in figure 3-1, vertical lines of communication exist between the Administrator and the programs under the purview of the Associate Administrators and with the nine regional offices. However, the chart also illustrates that 22 separate groups report to the Administrator and that no formal lines of communication are apparent among the operating programs and within program divisions. Moreover, even when communication lines exist, they are often ineffective because of timing and rigidity of responsibilities. For example, under the Associate Administrator for Development and Logistics, individual program managers in two offices are responsible for meeting milestones in the development and implementation of NAS subsystems. A third office is responsible for defining requirements and ensuring that individual subsystems combine effectively to form an overall system. Because many of the programs in the NAS Plan are already well underway by the time requirements are defined and validated, program managers have difficulty refocusing away from milestones and responding efficiently to inputs from other groups.

Within the last 15 years, FAA has had seven administrators, serving an average of 2 years. Although this length of term is not unusual for Administration appointees, this high rate of turnover highlights a central concern about FAA's capability to per-

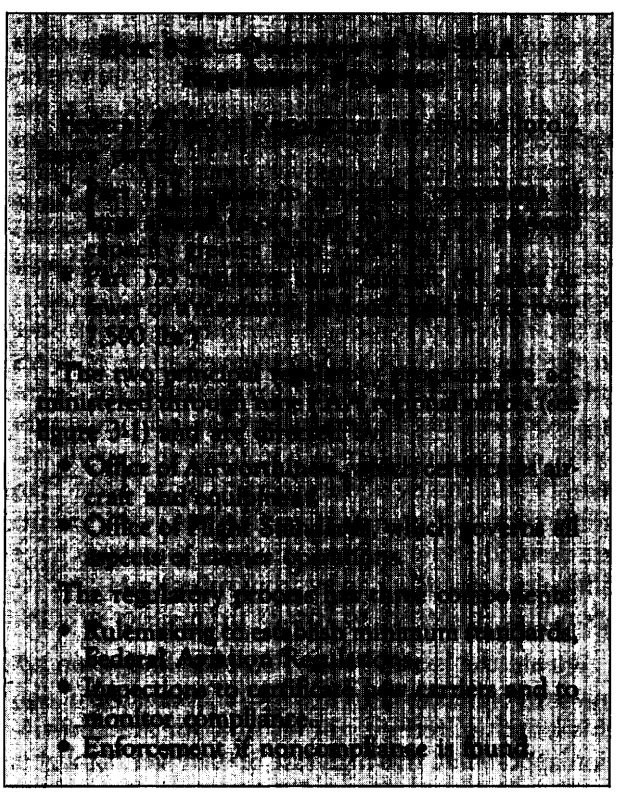
form its safety mission–the requirement for long-range planning and policy commitment. Since many of FAA's responsibilities involve long-range programs, such as the modernization of equipment and facilities, the absence of consistent leadership is severely felt.

FAA REGULATORY PROGRAM (see box 3-B)

Although largely unnoticed by the traveling public, Federal safety regulations, administered by FAA, establish the basic safety structure for U.S. aviation. Regulatory and oversight functions are primarily housed under the Associate Administrator for Aviation Standards, and activities of two of its offices are critical during times of major industry change.

The Office of Airworthiness

The Office of Airworthiness has two prime functions: to establish minimum standards for the design and manufacture of all U.S. aircraft and to certify that all aircraft meet these standards prior to introduction into service. Airworthiness standards prescribe explicit flight, structural, design and construction, powerplant, and equipment requirements.



The office issues "type"[32] certificates to prototype aircraft built in conformance to airworthiness standards after successful testing. Manufacturers try to ensure that individual aircraft conform to the type to obtain FAA airworthiness certification. If major changes are made in an aircraft design, a new type certificate is required. However, if less extensive changes are made, FAA amends a type certificate and issues a supplemental one. As pilots must have additional and expensive training to operate a new type of aircraft, manufacturers and airlines prefer continuous supplemental certificates and pilot type ratings.

Four FAA regional offices have certification authority for aircraft and certain systems:

- Central Region (Kansas City) certificates general aviation aircraft.
- New England Region (Boston) certificates engine and propulsion systems.
- Northwest Mountain Region (Seattle) certificates large commercial aircraft.
- Southwest Region (Fort Worth) certificates helicopters.

This decentralized management lends itself to internal FAA disagreements over regulatory actions and sometimes outright contradictions (see box 3-C for details).

Office of Flight Standards

Commercial aircraft are spot checked by Flight Standards inspectors to ensure they comply with Federal Aviation Regulations. This office certifies that new air carriers meet Federal standards and approves flight procedures, determines some equipment regulations, and is responsible for seeing that inspectors conduct routine safety inspections.

[32] 14 CFR 1.1 (Jan. 1, 1987).

Box 3-C.—A Case Study: 747-400 Passenger Exit Doors

A long simmering controversy over regulations on exit doors of large transport aircraft illustrates the interaction of FAA regulatory offices, industry, union groups, Congress, and the legal system. The controversy began in 1983 when Boeing Aircraft Co. proposed to modify some inservice 747 aircraft by sealing off two passenger exit doors over the wings. The modification expanded the section for business class passengers and reduced the cost penalty for carrying and maintaining the exits. Boeing intended to supply airlines with kits to make the modification if they desired and to offer its new 747-400 model with the overwing exit doors in place, but closed off.

Current regulations require one pair of Type A exits (large exits each side of the fuselage in all locations on the 747) per 110 passengers; no restrictions are placed on spacing between the exits or between passengers and exits.[1] Boeing planned to restrict the number of passengers to 440 on the 747 when it removed the overwing exits, to ensure that the aircraft complied with regulations. The Northwest Mountain region of FAA, responsible for aircraft certification, approved the change in 1984.

The approval caused an outcry from cabin attendants' unions, including the Association of Flight Attendants, who informed FAA they intended to ask Congress to intervene on grounds of diminished safety. After the resultant publicity, Thai International Airlines started reinstalling overwing exits on its modified 747s.[2] The FAA Administrator wrote to the Chief Executive Officers of U.S. airlines recommending overwing doors not be sealed off even though the configuration was certified by FAA. The Administrator subsequently announced his position at a hearing before the House Public Works and Transportation Subcommittee on Investigations and Oversight, much to the surprise of other high ranking FAA officials. U.S. carriers have followed his advice, possibly out of fear of litigation if there were a crash. However, some foreign carriers have sealed off their exits.

Despite the Administrator's recommendation, Boeing has been marketing an eight-exit configuration for its 747-400. FAA has written a Notice of Proposed Rulemaking that would require no more than 60 feet between exit doors and no more than 30 feet between any passenger and a door. If approved, the rule would not permit 747-400 certification with eight exits. Also, it would exclude foreign-owned 747s with eight exits from operating within the United States.

FAA maintains that the current regulations do not specify a distance between doors and that Boeing is stretching the limits of the current regulations too far.[3] Boeing maintains that a rule change at this point is unjustified and that evacuation tests and limited accident data show the eight-door configuration meets current requirements for evacuation of the plane and thus is adequate from a safety standpoint.[4] Boeing filed suit on September 9, 1987, in the 9th Circuit Court of Appeals in San Francisco, asking the Court to review an FAA order disapproving type certification of the 747-400. FAA reaffirmed its position at a hearing of the House Public Works and Transportation Subcommittee on Investigations and Oversight on March 2, 1988.

[1]14 CFR 25.807 (Jan. 1, 1987).
[2]Bron Rek, "Escape From Burning Cabins: Are Smoke Hoods the Answer?" *Interavia*, vol. 42, January 1987, pp. 37-38.
[3]Melvin C. Beard, director, Office of Airworthiness, Federal Aviation Administration, personal communication, Aug. 26, 1987.
[4]Robert A. Davis, 747 chief project engineer, Boeing Commercial Airplane Co., letter to OTA, Oct. 13, 1987.

FAA inspections are divided into three functional categories:

- Operations, including minimum equipment lists, pilot certification and performance, flight crew training, and in-flight recordkeeping.
- Maintenance, including maintenance personnel training policies and procedures for overhaul, inspection, and equipment checks.
- Avionics, specializing in aviation-related electronic components.

Usually, each airline is assigned a principal inspector for each of the three categories of inspections. The principal functional area inspectors are assisted by inspectors from one of the 90 FAA district offices within whose boundaries the airline operates. In addition to certificating new airlines and performing routine inspections, FAA principal inspectors are responsible for investigation and enforcement duties.[33]

[33]U. S. Congress, General Accounting Office, *Report on Aviation Safety: Needed Improvements in FAA's Airline Inspection Program are Underway,* GAO/RCED 87-62 (Washington, DC: May 1987), p. 12.

Regulatory Program Issues

In the years just prior to deregulation, standards and procedures followed by major U.S. airlines often exceeded minimum Federal requirements. However, starting in 1978, economic forces exerted great pressure on redundancies in industry safety programs, eliminating some and intensifying the importance of strong Federal enforcement programs. At the same time, FAA's capability to monitor the industry was swamped by problems, which were in part products of executive branch policies and governmental budget constraints, and which were independent of deregulation, although deregulation magnified their impact.

Investigations conducted since 1983 by FAA itself, the General Accounting Office (GAO), and NTSB cited weaknesses in the FAA inspection programs. OTA research confirms that severe difficulties persist, although work is underway to standardize procedures and provide for greater flexibility in personnel assignments.

Criticism of the FAA inspection program generally focuses on three categories: manpower and training, information systems, and management control. Manpower problems became acute during the early years of deregulation when Federal budget constraints required cuts in the inspector work force. At the end of fiscal year 1978, FAA had 1,580 Flight Standards field office inspector positions authorized, and actual employment was 1,466. By fiscal year 1981, the authorization had risen to 1,748, and 1,615 inspectors were "on board" on September 30, 1981. Three years of deep budget cuts reduced the authorization by 18 percent to 1,440 inspectors by the end of fiscal year 1984. (Actual employment on September 30, 1983, was 1,331 inspectors.) At the end of fiscal year 1978, there were 556 "air carrier" inspectors employed (605 authorized) which increased to 623 (674 authorized) by the end of fiscal year 1981, and fell to 507 (569 authorized) by the end of fiscal year 1983. The planned end of fiscal year 1984 authorization was 508, later increased to 674 (the 1981 high). Thus, while the number of airlines was rapidly rising in the years following deregulation (the number of commercial operators roughly doubled between 1979 and 1983), the number of air carrier field inspectors in FAA was rapidly declining. Inspectors were shifted from routine operations and maintenance inspections to airline certifications. FAA's end-of-year goal for fiscal year 1988 is 2,088 field office inspectors, and FAA plans to add about 285 inspectors in each of fiscal years 1989, 1990, and 1991.[34]

Moreover, even if numbers of newly hired inspectors reach adequate levels, FAA inspector training programs cannot keep up with new industry procedures and equipment, such as contract maintenance work and new cockpit technologies. Training is most problematic in areas of recent technological development, such as advanced composite materials used by aircraft manufacturers, new navigational systems, and other computerized systems.[35] As aircraft and technologies become more complex and sophisticated, training for inspectors will become even more critical.

Furthermore, FAA managers have long lacked current and reliable information on allocation of inspectors and inspection records, leading to inconsistencies among FAA district offices, and inadequate followup to inspection activities. Shortages of computerized equipment and lack of high quality core training at the Oklahoma City Academy exacerbate information difficulties.

Traditionally, FAA has delegated broad authority to regional and district offices concerning the frequency and scope of inspections. FAA regional offices stoutly reaffirm the importance of meeting regional needs at the regional level, leaving general policy guidance to Washington. However, FAA headquarters has never effectively centralized management control to permit evaluating regional and district inspection activities, to ensure uniformity in policies and procedures, and analyze inspection findings on a national scope. Wide variations in the number and kind of inspections performed from region to region identified by GAO in 1985, still persisted according to OTA's research.[36]

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[34] Anthony J. Broderick, associate administrator, Aviation Standards, Federal Aviation Administration, personal communication, Mar. 31, 1988.

[35] General Accounting Office, op. cit., footnote 33, p. 50.

[36] U.S. Congress, General Accounting Office, *Compilation and Analysis of the Federal Aviation Administration's Inspection of a Sample of Commercial Air Carriers,* RCED-85-157 (Washington, DC: Aug. 2, 1985); and OTA primary research.

The competence and professionalism in the manufacturing and operating industries ensure airworthiness of commercial aircraft to current standards, and past history shows that industry safety standards are almost always high. FAA needs adequate technical expertise and records to be able to target the rare cases where standards are not sufficiently high, as well as knowledge about industry management attitudes and financial stability.

To improve management of its inspection responsibilities over the long term, FAA initiated Project SAFE, a program to establish staff standards, increase staff levels, improve inspector manuals and training courses, and establish performance standards for each FAA regional office. Task forces made up of headquarters and regional staff are revising and standardizing inspection manuals and training policies. Needed improvements to training courses in Oklahoma City and standardizing of regional on-the-job training are planned under Project SAFE, but are moving at a snail's pace. Moreover, emphasis on monitoring individual airline characteristics, such as compliance records, fleet composition, management changes, and financial stability, would permit FAA to allocate its inspector resources more effectively.

Adequacy of FAA Minimum Standards

The recent major airline crash in Denver and a spate of commuter accidents focus attention not only on inspection programs, but also on the adequacy of FAA minimum safety standards. Although most airlines maintain standards above the minimum required by FAA, some safety officials are concerned that the minimum may not be adequate in some instances. Because of such concerns, the Department of Defense has instituted a safety program that frequently uses a higher standard in selecting contract airlines than the minimum standards required by FAA.

In response to the 1985 crash of a military chartered DC-8 in Gander, Newfoundland, the Military Traffic Management Command (MTMC) and the Air Force Military Airlift Command (MAC) overhauled their inspection program and established an Army/Air Force Central Safety Office to coordinate standard setting and inspection activities. Enforcement actions against the airlines are the responsibility of a military review board.[37] The MTMC/MAC office conducts inspections, in addition to FAA's, of all airlines used for military charters. During the 2 years since the Gander crash, the safety office has disqualified 13 U.S. airlines and taken lesser disciplinary actions against 9 others. Poor maintenance practices and failure to comply with airworthiness directives are the most frequent problems. Half of the cited airlines were large carriers operating under Part 121.

By the summer of 1988, the MTMC/MAC safety program will be supported by a new database. The Air Carrier Analysis System (ACAS) will compile and analyze data on airline accidents, incidents, maintenance and operating problems, and financial characteristics. The system will alert inspectors to those circumstances at an airline that warrant personal inspections and provides a useful model for FAA, which is cooperating with MTMC/MAC.[38] However, ACAS relies upon FAA databases which are incomplete and are not designed to support analyses.

The FAA Rulemaking Process

Prior to deregulation, FAA had considerable regulatory autonomy, overseeing an industry in which profits were protected through the extensive rate and entry rules of CAB. Over the past decade, vigorous industry economic competition has made rulemaking a distinctly adversarial process. Carriers, labor groups, aircraft manufacturers, and general aviation supporters carefully scrutinize every proposed safety regulation and question its efficacy and impact on costs. Often such activities, in concert with administrative policies and bureaucratic labyrinths, have effectively blocked safety regulations for years.

Presidents Ford, Carter, and Reagan each initiated progressively stronger and more centralized programs of regulatory review in response to concerns about the excessive burdens and inadequate management of Federal regulations. These policies, implemented explicitly through Executive Orders in 1981 and 1985, direct agencies to:

[37] James Ott, "Military Avoids U.S. Carriers That Fail Safety Standard," *Aviation Week & Space Technology,* Feb. 8, 1988, pp. 99-101.
[38] Ibid. and Broderick, op. cit., footnote 34.

- base their regulatory rulemaking decisions on benefit-cost analyses,
- submit new regulations for review by the Office of Management and Budget (OMB),[39]
- refrain from starting work on any significant new regulation until consulting with OMB, and
- publish in the annual Regulatory Program a status report on each significant regulatory initiative.

While all executive branch agencies have had to revamp their regulatory procedures as a result of these Executive Orders, FAA has faced a special challenge because proposed remedies to safety risks often entail expensive technological developments requiring long lead times.

Moreover, DOT has gone substantially beyond Executive Order mandates for economic review of proposed rules for all its modal agencies. Cost-benefit analyses are required only for identified "major" regulations, but in contrast to some other executive branch agencies, DOT expanded this requirement to include "significant" rules, a category that covers nearly all regulations.[40]

For FAA, the review process now consists of the following major steps:

- FAA advises the Office of the Secretary of intent to start work on a significant regulation. DOT departments register concerns about the proceeding or about analysis needed.
- A team of FAA staff members develops a new rule proposal.
- A member of FAA's Office of Aviation Policy, who also serves on the rule-drafting team, prepares the cost-benefit analysis.
- After FAA approval, the regulatory package, complete with economic analysis, moves to DOT's General Counsel Office for a required departmental review, including Assistant Secretaries for Policy and International Affairs, Government Affairs, and Budget and Programs.
- Prior to public release, the General Counsel mediates 'OMB's review of the regulation and economic analysis.

In a major review of its regulatory program in 1984, FAA identified over 100 regulations needing revision. Twenty-six regulations were assigned high priority status and are currently in various stages of the process; another 85 form a large backlog. Long backlogs can lead to "immediate action" regulations and inspector handbook changes that alter regulations without adequate due process. While FAA plans a rewriting of Part 121 and 135 regulations, this major undertaking will require years of intensive effort.[41]

[39] Thomas Hopkins, "Aviation Safety Rulemaking," OTA contractor report, August 1987, p. 5.
[40] Ibid, p. 7.
[41] General Accounting Office, op. cit., footnote 33, p. 26.

AIR TRAFFIC CONTROL ISSUES

In the aftermath of the controller's strike and concurrent with its effort to even out traffic flow, FAA began to rebuild the controller work force by hiring, training, and certifying new controllers at an accelerated pace. Anticipating a more efficient controller work force as a result of NAS Plan improvements (see chapter 7) and believing that the pre-strike work force was overstaffed, the administration established a target work force goal of 14,306, lower than the pre-strike level. Also, believing that the pre-strike controllers were more qualified than necessary, FAA lowered the goal of full performance level controllers to 75 percent from 80 percent.

FAA has succeeded in achieving some of the goals of its recovery schedule but not all. The primary goal of FAA's recovery plan was to return to 100 percent of pre-strike traffic level, with flow control in place, by June 1983. This target was met on schedule, but goals to reduce the extensive use of flow control and to have controllers return to normal work schedules in every facility still elude the agency. Also, supervisors still work traffic during peak hours more and work more overtime hours than before the strike.

The rebuilding process has been slow and tedious. Because of the special aptitudes required for the job, a higher than expected washout rate of new recruits has slowed recovery. Also, retirements, promotions to supervisory jobs, and normal attrition has cost the controller work force many of its most

Photo credit: Federal Aviation Administration

FAA air traffic controllers handle traffic in the Dallas-Fort Worth Terminal Radar Approach Control (TRACON) facility.

experienced members, about 500 each year from retirements alone.[42] Training capabilities have been especially hard hit.

The effects of the strike on individual airports varied widely. Some were hardly affected, while others lost most of their work force. In general, the effect was greatest where the union was most active—in Chicago and New York City airports, more than 95 percent of the full performance level controllers struck and were fired. More remote, less demanding facilities had few strikers. The resulting disparity in the geographical distribution of experienced controllers remains a very difficult problem for FAA.

Moreover, even at present, differences in living costs, traffic volume and complexity, and other factors, compound difficulties in filling controller vacancies in major metropolitan areas such as Los Angeles, Chicago, New York, and Boston. In mid-1986, O'Hare airport had 52 vacancies for full performance level controllers. Special FAA programs to attract experienced controllers to these busy facilities have had only limited success, and staffing shortfalls must be met with newly trained recruits. Therefore, the controller work force at some of the busiest airports can be among the least experienced or trained. While FAA has a mandate to increase the air traffic controller work force to 15,800 by October 1988, the increase in total numbers of controllers will not eliminate these particular problems.

[42] Cecilia Preble, "Growth of Air Traffic Raises ATC Staffing Issue," *Aviation Week & Space Technology,* Mar. 31, 1986, p. 44.

FAA TECHNOLOGY DEVELOPMENT ISSUES

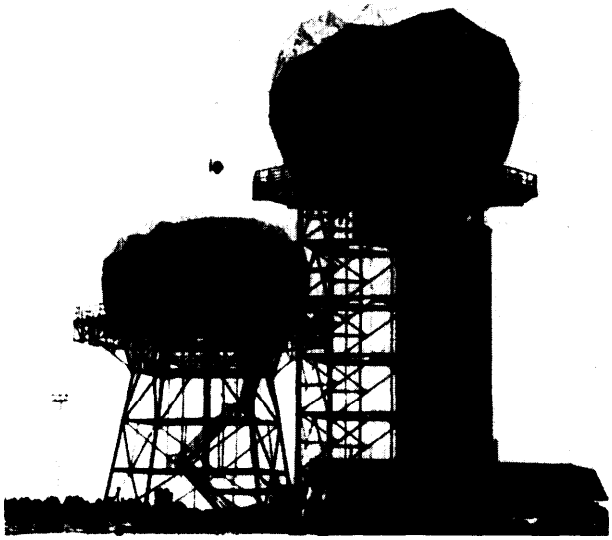
Federal acquisitions of major technical support systems are governed by OMB Circular A-109, which divides acquisition into four steps:

- Identification of mission need for a technological system, including some development of cost and schedule goals.
- Identification and exploration of alternative design concepts, followed by demonstration of the concepts.
- Full-scale development and limited production.
- Full-scale production.[43]

However, FAA does not always follow this standard protocol. For example, none of the original 11 major NAS Plan programs adhered to A-109, and all the programs that have reached key decision points have skipped steps in the process. Such shortcuts have led so far to successful deployment of the Host computer system at Air Route Traffic Control Centers only 6 months behind the original schedule. Other programs have slipped far behind schedule and have incurred large cost increases compared to original estimates. Schedule slippage and cost increases are not unusual for large and complex government development programs. However, some NAS Plan delays were incurred because the components as originally conceived could not be completed without additional engineering work and adaptation to the rapidly changing air traffic system. None of these were adequately anticipated in the original plan.

The long-term NAS Plan programs have not met shorter-term needs of the system—these shorter-term needs require the capability for anticipating problem areas and rapid development and operational testing of alternative solutions, in addition to long-term developments.

[43] U.S. Congress, Office of Management and Budget, "Major System Acquisitions: A Discussion of the Application of OMB Circular No. A-109," OF PP Pamphlet No. 1, August 1976.



Manpower and Training Needs

Manpower, logistics support, and technical training needs were not fully considered in designing the NAS development program. As NAS becomes more fully automated, personnel who maintain NAS equipment and other highly technical programs will require sophisticated training. Also, budget constraints have held down appointments for technicians to maintain NAS systems in the field, of significance because many current technicians will be eligible for retirement soon.[44]

Because contractor maintenance of NAS equipment is not always of sufficient quality, FAA must train technicians. Classroom and laboratory training are done at the FAA Academy, which is not well prepared to meet the needs. The rapid influx of new, automated NAS systems requires rapid development of new training courses and, over time, will require radical changes in requirements for training of field personnel. Field technicians who troubleshoot equipment will be replaced in the future by engineers who monitor system parameters remotely for signs of trouble. This will call for broader, more sophisticated training than is now usually given at the Academy. Capabilities are being developed for more efficient design of training courses, including job task analysis, computer-based instruction, and an automated training development system. Still, the Academy views NAS Plan delays with relief, because they allow more time for training course development.[45] Moreover, instructors' grades at the Academy (GS-12) are not as high as those of automation engineers and systems engineers in the field, and instructors at the Academy are sometimes snubbed for the higher-grade jobs when they return to the field.[46] These conditions are not conducive to more sophisticated training at the Academy.

[44]Mel Yoshikami, manager, Airways Facilities Division, Federal Aviation Administration, personal communication, Aug. 6, 1987.
[45]Morris Friloux, superintendent, Federal Aviation Administration Academy, personal communication, Dec. 8, 1987.
[46]Richard J. McCarthy, training branch manager, Airways Facilities, Federal Aviation Administration, personal communication, Dec. 14, 1987.

AIRPORT ISSUES AND SAFETY

The Federal role in airport development and management has grown as airports have become increasingly critical links in the Nation's transportation system. In the early years of U.S. aviation, Congress held that airports were not a matter of Federal interest and should be developed and managed locally. Federal responsibility was limited to charting airways, providing lights for night flying, maintaining emergency fields, and furnishing weather reports. However, World War II changed this limited perspective, and national defense became a major rationale for Federal participation in airport development. Congress appropriated $500 million from the general fund for a capital grants program for airport improvements in the Federal Airport Act of 1946.[47] The Federal Aviation Act of 1958 continued the policy of providing support for airport

[47]U.S. Congress, Office of Technology Assessment, *Airport System Development* (Washington, DC: U.S. Government Printing Office, August 1984), p. 29.

development from the general fund, although Congress was becoming uncomfortable with this type of direct subsidy with general funds.

In the Airport and Airway Development Act of 1970, Congress institutionalized Federal airport aid, establishing the Airport and Airway Trust Fund to modernize ATC and support the Airport Development Aid Program (ADAP). The act levied an airline ticket tax and a GA fuel tax to provide a dedicated source of revenue; it also provided grants through ADAP to assist airport operators in funding capital projects. In 1982, Congress reauthorized the Airport and Airways Trust Fund and initiated a new capital grant for airport improvements. Recognizing State and local noise concerns, the act earmarked 8 percent of these new funds for noise abatement projects. In December 1987, Congress reauthorized the Trust Fund, reaffirming support for joint Federal/State/local responsibility for airports.

FAA has always played an important role in the operational side of airport management. Because it owns and operates the ATC system, including many ATC towers, navigational equipment, and landing aids, it directs the flow of traffic in the local airways and in and out of commercial airports. In this capacity, FAA has direct control of and responsibility for air traffic safety. Airport improvements that require installing, moving, or upgrading ATC equipment have to be approved and implemented by FAA. In addition, safety and operational standards for airports, established by FAA, must be followed in projects supported by Federal funds.

Local Control of Airports

Despite an increase in Federal involvement in airport development and operations over the last 20 years, most airports in the United States are locally owned and operated. More than half of the Nation's large and medium commercial airports, and a greater percentage of small commercial facilities are operated by municipal and county governments.[48] A typical municipally operated airport is city-owned and run as a department of the city, with policy direction by the city council or by a separate airport commission or advisory board. Another large group of airports are run by multipurpose port authorities—public corporations that operate a variety of publicly owned transportation facilities such as harbors, toll roads, and bridges. Also, single-purpose authorities operate both medium-size airports and large facilities.

Airport Noise

Noise became a major political and environmental issue in the early 1960s with the widespread introduction of commercial jet aircraft. FAA estimates that the land areas affected by aviation noise increased about sevenfold between 1960 and 1970.[49] Residents living near airports and along flight paths complain that aircraft noise is annoying—especially at night—and depreciates the value of their property. Scientific evidence corroborates that high exposure to noise can lead to high stress levels, nervous tension, and inability to concentrate. Although according to FAA only about 2 percent of the U.S. population is affected by aircraft noise, the noise issue has affected operations at many major airports and is a major factor in constraining airport expansion and development.[50]

Reacting to public outcry, Congress amended the Federal Aviation Act in 1968, requiring the FAA Administrator to take regulatory action to control and abate aircraft noise. To reduce the noise made by aircraft and engines, FAA established maximum noise standards for newly manufactured aircraft engines through FAR part 36. Known as stage 3 aircraft, those that meet the quieter standards are expected to replace existing equipment by the year 2000. FAA grant funds are available for noise abatement programs including purchase of equipment to measure noise, sound proofing nearby buildings, and even the purchase of contiguous property severely affected by aircraft noise.

While FAA supports the concept of local noise abatement programs, it leaves regulating noise to the airport operators. A Federal noise standard could expose the Federal Government to liability for damages if the standards were exceeded. Moreover, restricting air traffic for other than safety reasons conflicts with FAA's mandate to foster air

[48] Ibid, p. 21.

[49] Ibid, p. 21.

[50] Ibid.

commerce. However, FAA has established guidelines for measuring noise and has suggested methods for determining land uses compatible with various day-night average sound levels. On the other hand, Executive Order 12371 requires that Federal agencies such as FAA, consult and cooperate with local governments in the administration of Federal assistance and development programs. This review and approval power provides local and regional governments with leverage to require adoption of noise standards and to require noise abatement measures as part of a federally financed airport development project.

Motivated by political pressure from local residents and the fear of liability claims, airport operators are using their authority—although limited—to control noise. The basic legal ground rules for noise control strategies are that they be nondiscriminatory, do not unduly burden interstate commerce, and have the effect of reducing noise. Finally, noise abatement restrictions must not interfere with safety or the Federal prerogative to control aircraft in the navigable airspace.

Local restrictions on aircraft to reduce noise generally fall into three groups. One strategy is to modify flight paths in cooperation with local ATC staff so that aircraft fly over water, industrial or vacant land, and avoid densely populated areas. Second, local airports can limit the number of flights or the types of aircraft; and third, some airports are experimenting with noise budgets that set a maximum daily decibel total, which the airport allocates among carriers.

Undeniably, noise abatement restrictions reduce airport capacity and can cause delays, sending ripples throughout the air traffic system. Moreover, pilots on tight schedules are tempted to abbreviate check lists and fly above FAA-approved speeds to beat nighttime curfews at their destinations. Some departure and arrival speed and flight path control requirements may adversely affect safety, and FAA needs better analytic tools to help identify the impacts on safety and develop countermeasures for the curfew restrictions. Finally, noise restrictions create equity issues. Although the courts have struck down blatantly discriminatory plans, stringent noise restrictions could force carriers to accelerate fleet replacement.

Land Use Policies and Airport Capacity

The absence of strong, local land use policy to protect existing airports from encroaching development limits the capacity potential of the airport system. Land suitable for airport expansion is either too expensive or unavailable, and hostile neighbors seek to limit the number of existing flights. Ironically, the availability of highway access and utilities required by the airport attracts residential development. In rural jurisdictions on the fringes of metropolitan areas, local officials often do not support land use controls, and airports unprotected by regulations become focal points for development.

Obstacles to Expanded Airport Capacity

Local and regional governments do not find it easy to gain wide public support for long-range commitments to runway and airport planning and construction. During the next 10 years, construction may begin on only two major new airports (a replacement for Denver's Stapleton and a new one at Austin, Texas), and even that modest estimate may not be achieved. The complexity of any airport project requires coordination and agreement among Federal, State, local and regional governments on airport siting and specific development and acquisition plans and projects. To highlight the enormity of land acquisition, the Dallas-Fort Worth Airport required the purchase of 18,000 acres and agreements protecting an additional 4,000.

In short, additional airport capacity is years away, and FAA needs systematic plans to handle safely projected increases in demand, which may include demand management where necessary. The alternative is to accept delays as an inevitable accompaniment to an overburdened system.

CONCLUSIONS AND POLICY OPTIONS

While FAA's dual responsibilities of providing aviation safety and fostering air commerce are not always incompatible, in times of rapid industry change, they present the agency with unavoidable conflicts. Congress may wish to identify safety as FAA's sole and unique responsibility, especially for ATC and regulatory programs. Responsibility for fostering economic development of the industry could be returned to the Secretary of Transportation. Given the current growth of the industry, the competitive industry climate, and the constraints on FAA personnel levels and technical expertise, reaffirmation of the primacy of safety could clarify goals for allocating FAA resources. Industry promotion functions are compatible with DOT's economic and consumer protection functions, and DOT staff is better-suited to deal with complex economic and political questions of demand management than the highly trained technical personnel in FAA. Close communication should be maintained so DOT aviation policy makers have the advantage of FAA's technical knowledge and safety expertise.

Many of FAA's problems identified in this chapter have their roots in the bureaucratic culture and are characteristic of most Federal agencies. The lack of agency autonomy over personnel, procurement processes, and budget decisions and its inability to adapt quickly to change are not problems unique to FAA and will exist to some extent regardless of the organizational structure within the government. Undeniably, however, FAA's effectiveness during the recent past has been undercut by national budget problems that have limited the FAA work force in numbers (see table 3-1) as well as levels of technical expertise. OTA finds that assisting FAA to overcome some of these special difficulties is an important safety priority for Congress to consider. For example, provision for cost of living adjustments for assignments in major metropolitan areas could ease transfer of personnel to facilities with special needs. Mechanisms to speed contracting procedures for training and other vital procurements could be helpful.

While there is general agreement about the organizational and operational weaknesses of FAA, proposals for reform range widely. The debate over reshaping the Federal Government's oversight bureaucracy centers around these general concepts:

- Length of the Administrator's term.
- Policymaking relationship between DOT and FAA.
- Status of ATC functions. Proposals include contracting ATC service to a private provider, establishing a Federal corporation, and forming a nonprofit, user-owned corporation.
- Status of the Aviation Trust Fund. Debate centers around the unified Federal budget process.

The frequent turnover of Federal administrators works against unified decisionmaking and the implementation of comprehensive long-range planning in every agency, and FAA is no exception. OTA finds that without stronger leadership, FAA problems of inadequate long-range planning, interdepartmental coordination, management information, and uneven application of regulations by regions are bound to continue. Congress may wish to consider setting a fixed term of up to 5 years for the FAA Administrator. A seasoned administrator will have a better chance at tackling the bureaucratic problems of procurement and personnel and budget restrictions.

Allocation of agency resources through the budget process requires close coordination with planning goals to ensure support of priority objectives and programs. A strong administrator could establish, through reorganization or management directives, greater control over the regional offices to ensure coordination, consistent policy, and even-handed application of regulations. Organizational changes and management incentives could improve internal communications among operating programs and within program divisions. To keep up with the technological and structural changes in the industry, FAA's rulemaking process needs to be streamlined and safety considerations better integrated into all levels of analysis. As the industry grows and aircraft technologies become more complex and sophisticated, FAA's need for more and better trained inspectors and technical personnel will become even more critical. Equally important is the need for hiring and adequate training of personnel responsible for maintaining the technology of NAS.

To provide accountability for the fixed-term administrator, Congress may wish to require him or her to develop a rolling 5-year agency development plan and to report annually on its status. Based on clearly stated goals and objectives for personnel, technology, and regulations, such a plan could provide Congress with a tool for assessing the agency's progress and a picture of its long-range direction.

Noise issues will continue to constrain airport operations and development. ATC bears the brunt of the safety implications of such local regulations and the impact of increased demand on major hub airports. Advocates of an independent ATC system reason that this large, highly technical operation could be more efficiently managed if separate from the Federal regulatory program. **OTA** finds that the ATC function is inextricably linked with aviation safety and is a central component of an integrated FAA safety system. While Congress has demonstrated its reluctance to alter the current policies pertaining to the use of the Aviation Trust Fund, short-term improvements to ATC to address capacity problems and the need for enhanced FAA technical expertise are immediate needs that could be addressed by resources from the fund. Demonstration by FAA of a plan to use funds specifically for such purposes could help to convince Congress to authorize them. However, other ongoing FAA activities fall under the Federal responsibility for safety in interstate commerce and are appropriately supported by the General Fund. Moreover, FAA could further enhance its technical expertise by better use of existing Federal resources at the National Aeronautics and Space Administration (NASA) and NTSB.

Furthermore, **OTA** concludes that FAA needs a strong, comprehensive, internal safety management system to support planning and ensure that the full resources of the agency coordinate and focus on the most important safety issues. **ATC** improvements, regulatory and enforcement programs, and **NAS** Plan programs in particular ware rant attention from a system safety perspective. Currently, in the absence of system safety management at FAA, backed by strong technical expertise, safety issues come to Congress and other groups, ill-suited to perform safety management functions.

Although many in the aviation community find DOT intrusive and overly political, DOT represents FAA's interests in the cabinet—especially important during budget formulation—and often provides a balanced policy viewpoint on some issues in contrast to FAA's technical perspective. Moreover, OTA finds that removing FAA from DOT does not by itself address the principal frustrations currently voiced. The sources of these frustrations are twofold: overall Administration policy and internal FAA management problems. OTA concludes that FAA independent of DOT would still be subject to Administration policies, just as NASA is. Furthermore, internal problems must be resolved by and within FAA proper.